

In the Claims

Please replace all prior versions of claims in the application with the following claims:

1. (Currently amended) A cache memory system, comprising:
a plurality of memory locations for storing data and addresses associated with the data,
~~each of the plurality of memory locations having only a single word line associated therewith~~
wherein the memory locations are organized as two or more ways; and
at least one controller that enables ~~first and second devices to access different ones of the~~
~~plurality of memory locations concurrently~~ a first device to access a first way selected from the
two or more ways and enables a second device to access a second way selected from the two or
more ways, wherein the first device can access any location in the first way and the second
device is blocked from accessing the first way during access by the first device, wherein the
second device can access any location in the second way and the first device is blocked from
accessing the second way during access by the second device, and wherein the first and second
ways can be accessed concurrently by the first and second devices, respectively.
2. Cancelled
3. Cancelled
4. (Original) The system of claim 1, in combination with the first and second devices, wherein the first device includes a processor configured and arranged to access the memory locations, and wherein the second device includes a data transfer engine configured and arranged to transfer data between the memory locations and a lower-level memory.
5. (Original) The combination of claim 4, wherein the data transfer engine comprises a DMA controller.

6. (Currently amended) A cache memory system, comprising:
a plurality of memory locations to store data and addresses associated with the data,
wherein the memory locations are organized as two or more ways;
a plurality of cache outputs for providing data retrieved from the memory locations; and
first and second multiplexers having multiplexer inputs coupled to at least some of the
memory locations and multiplexer outputs coupled to the plurality of cache outputs so as to
~~enable the first and second multiplexers to select data from different ones of the plurality of~~
~~memory locations to be~~ the first multiplexer to select data from a first way selected from the two
or more ways and to enable the second multiplexer to select data from a second way selected
from the two or more ways, wherein the first multiplexer can select data from any location in the
first way and the second multiplexer can select data from any location in the second way, and
wherein the selected data from the first and second ways is provided concurrently on respective
ones of the plurality of cache outputs.

7. (Cancelled)

8. (Withdrawn) A cache memory system, comprising:
a data array for storing data;
a tag array for storing tags associated with the data stored in the data array;
a load buffer coupled to the tag and data arrays to load tags and data into the tag and data
arrays; and
a first multiplexer having an output coupled to an address input of the load buffer, the
first multiplexer receiving as inputs first and second addresses from respective first and second
sources, and providing as its output a selected one of the first and second addresses.

9. (Withdrawn) The system of claim 8, in combination with the first and second
sources, wherein the first source includes a processor configured and arranged to access the tag
and data arrays, and wherein the second source includes a data transfer engine configured and
arranged to transfer data between the data array and a lower-level memory.

10. (Withdrawn) The combination of claim 9, wherein the data transfer engine comprises a DMA controller.

11. (Withdrawn) The system of claim 8, further comprising:
a second multiplexer having a first input coupled to an address output of the load buffer and a second input coupled to a source of third addresses, the second multiplexer providing as its output a selected one of the address output of the load buffer and one of the third addresses.

12. (Withdrawn) The system of claim 11, in combination with a data transfer engine that comprises the source of the second and third addresses.

13. (Withdrawn) The combination of claim 12, wherein the data transfer engine comprises a DMA controller.

14. (Withdrawn) The system of claim 8, further comprising:
a copy-back buffer coupled to the tag and data arrays to receive tags and data therefrom so that the received data can be transferred from the data array to a lower-level memory; and
a second multiplexer having an output coupled to an address input of the copy-back buffer, the second multiplexer receiving as inputs third addresses from the tag array and fourth addresses from a third source, and providing as its output a selected one of the third and fourth addresses.

15. (Withdrawn) A cache memory system, comprising:
a data array for storing data;
a tag array for storing tags associated with the data stored in the data array;
a load buffer coupled to the tag and data arrays to load tags and data into the tag and data arrays; and
a multiplexer having a first input coupled to an address output of the load buffer to receive first addresses therefrom and a second input coupled a source of second addresses, the multiplexer providing as its output a selected one of the first and second addresses.

16. (Withdrawn) The system of claim 15, in combination with the source of second addresses, which comprises a data transfer engine.

17. (Withdrawn) The combination of claim 16, wherein the data transfer engine comprises a DMA controller.

18. (Withdrawn) The system of claim 15, in combination with a lower-level memory, wherein the output of the multiplexer is used to load at least one memory word from the lower-level memory into the data array.

19. (Withdrawn) A cache memory system, comprising:
a data array for storing data;
a tag array for storing tags associated with the data stored in the data array;
a copy-back buffer coupled to the tag and data arrays to receive tags and data therefrom so that the received data can be transferred from the data array to a lower-level memory; and
a multiplexer having an output coupled to an address input of the copy-back buffer, the multiplexer receiving as inputs first addresses from the tag array and second addresses from a source distinct from the tag array, and providing as its output a selected one of the first and second addresses.

20. (Withdrawn) The system of claim 19, in combination with the source of second addresses, which comprises a data transfer engine.

21. (Withdrawn) The combination of claim 20, wherein the data transfer engine comprises a DMA controller.

22. (Withdrawn) A cache memory system, comprising:
a data array for storing data;
a tag array for storing tags associated with the data stored in the data array; and
at least first and second decoders adapted to receive and decode at least first and second respective addresses, the first decoder identifying, in response to receiving first addresses, first

locations in the tag array and first locations in the data array corresponding to the first locations in the tag array, and the second decoder identifying, in response to receiving second addresses, second locations in the tag array and second locations in the data array corresponding to the second locations in the tag array.

23. (Withdrawn) The system of claim 22, wherein each of the at least two decoders is preceded by a multiplexer that provides its output to that decoder, each of the multiplexers receiving the first and second addresses as respective inputs, and providing as its output a selected one of the first and second addresses.

24. (Withdrawn) The system of claim 22, wherein:
the tag and data arrays each have at least first and second ways;
the first locations in the tag array and the first locations in the data array are included, respectively, in the first way of the tag array and the first way of the data array; and
the second locations in the tag array and the second locations in the data array are included, respectively, in the second way of the tag array and the second way of the data array.

25. (Withdrawn) A cache memory system, comprising:
a data array including a first plurality of memory locations for storing data;
a tag array including a second plurality of memory locations for storing tags associated with the data stored in the data array; and
at least one controller configured to place the system in at least first and second states, wherein, in the first state, a first device has exclusive access to a first subset of the first plurality of memory locations and a second device has access to a second subset of the first plurality of memory locations, and, in the second state, the second device has access to at least one memory location in the first subset of the first plurality of memory locations.

26. (Withdrawn) The system of claim 25, wherein the at least one controller is configured such that, when the system is in the second state, the second device has exclusive access to the first subset of the first plurality of memory locations.

27. (Withdrawn) The system of claim 25, wherein the at least one controller is configured such that, when the system is in the first state, the second device has exclusive access to the second subset of the first plurality of memory locations.

28. (Withdrawn) The system of claim 26, wherein the at least one controller is configured such that, when the system is in the first state, the second device has exclusive access to the second subset of the first plurality of memory locations.

29. (Withdrawn) The system of claim 25, wherein:
the tag and data arrays each comprise at least first and second ways;
the first subset of the first plurality of memory locations is included in the first way of the data array; and
the second subset of the first plurality of memory locations is included in the second way of the data array.

30. (Currently amended) A method of operating an associative cache having a plurality of memory locations for storing data, ~~each of the plurality of memory locations having only a single word line associated therewith~~ wherein the memory locations are organized as two or more ways, the method comprising an act of:

~~(A) concurrently accessing with first and second devices different ones of the plurality of memory locations of the associative cache~~ a first device a first way selected from the two or more ways and accessing with a second device a second way selected from the two or more ways, wherein the first device can access any location in the first way and the second device is blocked from accessing the first way during access by the first device, wherein the second device can access any location in the second way and the first device is blocked from accessing the second way during access by the second device, and wherein the first and second ways can be accessed concurrently by the first and second devices, respectively.

31. Cancelled

32. (Original) The method of claim 30, wherein the first device includes a processor, wherein the second device includes a data transfer engine, and wherein the act (A) includes acts of:

(A1) using the processor to access the cache; and

(A2) using the data transfer engine to transfer data between the cache and a lower-level memory.

33. (Original) The method of claim 32, wherein the act (A2) includes an act of: using a DMA controller to transfer data between the cache and the lower-level memory.

34. (Currently amended) A method of operating an associative cache having a plurality of memory locations for storing data, and a plurality of outputs for providing data retrieved from the memory locations to respective devices, ~~each of the plurality of memory locations having only a single word line associated therewith~~ wherein the memory locations are organized as two or more ways, the method including an act of:

(A) concurrently providing data from different ~~ones~~ locations of the plurality of memory locations to the respective devices via the plurality of outputs, wherein first data from a first way selected from the two or more ways is provided to a first device via a first output and second data from a second way selected from the two or more ways is provided to a second device via a second output, wherein the first data can be selected from any location in the first way and the second data can be selected from any location in the second way.

35. (Currently amended) The method of claim 34, ~~wherein the associative cache includes at least first and second ways, and~~ wherein the act (A) includes an act of:

(A1) controlling first and second multiplexers to concurrently select as their respective outputs data from different ones of the ~~at least first and second ways~~ of the cache.

36. (Currently amended) A method of operating an associative cache having a plurality of memory locations, ~~each of the plurality of memory locations having only a single word line associated therewith~~ wherein the memory locations are organized as two or more ways, the method comprising an act of:

(A) using multiple decoders to decode respective addresses provided to the cache, including using a first decoder to decode a first address to access a first way selected from the two or more ways and using a second decoder to decode a second address to access a second way selected from the two or more ways, wherein the first address can access any location in the first way and the second address can access any location in the second way and wherein the first and second ways can be accessed concurrently by the first and second addresses, respectively.

37. Cancelled

38 Cancelled

39. (Currently amended) The method of claim 36, wherein each of the multiple decoders is preceded by a multiplexer that receives the first and second addresses as inputs and provides a selected one of the first and second addresses as an output to the decoder it precedes, and wherein the method further comprises an act of:

(B) controlling at least one of the multiplexers to select one of the first and second addresses as its output while concurrently controlling another of the multiplexers to select the other of the first and second addresses as its output.

40. Cancelled

41. (Currently amended) A cache memory system, comprising:
a plurality of memory locations for storing data and addresses associated with the data, ~~each of the plurality of memory locations having only a single word line associated therewith~~ wherein the memory locations are organized as two or more ways; and

~~means for enabling first and second devices to access different ones of the plurality of memory locations concurrently~~ a first device to access a first way selected from the two or more ways and enabling a second device to access a second way selected from the two or more ways, wherein the first device can access any location in the first way and the second device is blocked from accessing the first way during access by the first device, wherein the second device can access any location in the second way and the first device is blocked from accessing the second

way during access by the second device, and wherein the first and second ways can be accessed concurrently by the first and second devices, respectively.

42. Cancelled

43. (Withdrawn) A cache memory system, comprising:

a plurality of memory locations for storing data and addresses associated with the data, the memory locations being configured and arranged to be included in at least first and second ways normally accessible by a processor;

means for selectively preventing the processor from accessing the first way while permitting the processor to access the second way; and

means, distinct from the processor, for accessing the first way while the processor is prevented from accessing the first way.

44. (Withdrawn) A method of operating an associative cache including at least first and second ways normally accessible by a processor, comprising acts of:

(A) preventing the processor from accessing the first way while permitting the processor to access the second way;

(B) while the processor is prevented from accessing the first way but is permitted to access the second way, permitting a device other than the processor to access the first way; and

(C) at a time when the step (A) is not being performed, permitting the processor to access the first way.

45. (Withdrawn) The method of claim 44, wherein the act (B) includes an act of:

(B1) using a data transfer engine to transfer data between a lower-level memory and the first way.